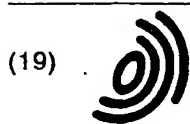


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## (54) Blood sampling device with adjustable puncture depth

(57) The present invention comprises a sampling device having a sleeve (1), a push element (2) mounted at a first end of the sleeve (1), a piston (5) having a fin (7) and a puncturing tip (8) extending from the fin (7), the piston (5) being slidably mounted in the sleeve (1), a drive spring (10) positioned between the end face (9) of the push element (2) and the piston (5), wherein at the other end of the sleeve (1) an adjusting ring (3) is mounted having an opening (4) for receiving the puncturing tip (8), the adjusting ring having two inner semi-annular limiting members (14, 15) each having a substantially oblique abutment surface, against which, the fin (7) of the piston (5) abuts during use. The device allows the depth to which the puncturing tip pierces the skin of a patient to be adjusted when taking blood samples, for example.

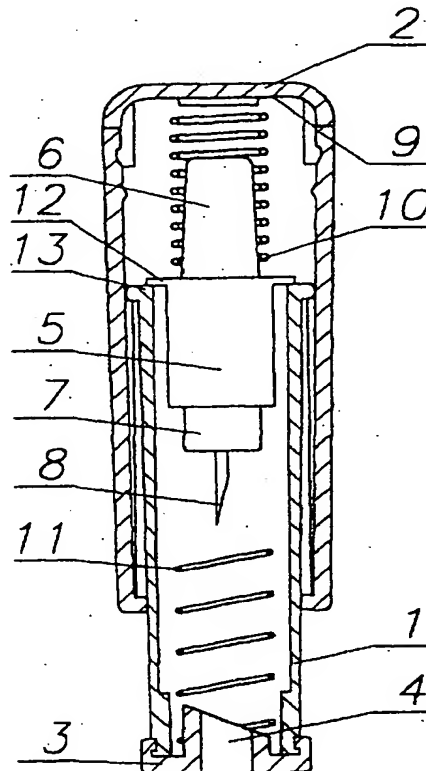


Fig. 1

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## Description

[0001] The present invention relates to an apparatus for regulating the depth of puncture, for use with a puncturing device suitable, in particular, for puncturing skin of a patient in order to take a blood sample for diagnostic purposes.

[0002] US patent 5,356,420 discloses a puncturing device comprising a sleeve and a push element positioned at one end of the sleeve. The other end of the sleeve is open. Within the sleeve there is a slidably mounted piston, which at the end closer to the push element terminates in a pusher, and which at the end closer to the open end of the sleeve terminates in a puncturing tip. Inside the sleeve, between the end face of the push element and the piston, a driving spring is located. A return spring is located between the piston and the open end of the sleeve. Wings are located on the outer circumference of the piston which rest on an internal projection of the sleeve.

[0003] According to one aspect of the present invention, there is provided a sampling device comprising a sleeve, a push element mounted at one end of the sleeve, a piston having a fin and a puncturing tip extending from the fin, the piston being slidably mounted in the sleeve, a drive spring positioned between the end face of the push element and the piston, wherein at the other end of the sleeve an adjusting ring is mounted having an opening for receiving the puncturing tip, the adjusting ring having two inner semi-annular limiting members each having a substantially oblique abutment surface, against which, the fin of the piston abuts during use.

[0004] The present invention also provides an apparatus for a sampling device, for regulating the depth of puncture of the sampling device, the sampling device comprising a sleeve, a push element mounted at one end of the above sleeve, a piston having a fin and a puncturing tip extending from the fin, the piston being slidably mounted in the sleeve, the apparatus being mountable on the other end of the sleeve, and the apparatus comprising an adjusting ring having an opening for receiving the puncturing tip, the adjusting ring having two inner semi-annular limiting members each having a substantially oblique abutment surface, against which, the fin of the piston abuts during use.

[0005] The sampling device of the invention is a puncturing device, primarily, but not only, intended for puncturing the skin of a patient and is generally referred to hereinafter as a puncturing device.

[0006] Preferably the outer surface of the adjusting ring is provided with a marker, and on the outer surface of the sleeve is provided with a scale for indicating the depth of the puncture.

[0007] For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

Fig. 1 shows a longitudinal section through a puncturing device with the apparatus for regulating the depth of the puncture before use in accordance with the first aspect of the present invention;

Fig. 2 shows a perspective view of an apparatus for regulating puncture depth in accordance with the second aspect of the present invention;

Fig. 3 shows a side view of the puncturing device of Fig. 1 with a scale for indicating the depth of the puncture in use;

Fig. 4 shows a longitudinal section through the puncturing device with the apparatus for regulating depth of the puncture of Fig. 1, after use.

[0008] The puncturing device shown in Fig. 1 comprises a sleeve 1 and a push element 2 mounted at one end of the sleeve 1 and surrounding substantially the entire length of the sleeve 1. At the other end of the sleeve 1 is an adjustment ring 3 having an opening 4.

[0009] A slidably mounted piston 5 is located within the sleeve. At the end closer to the push element 2, the piston has a pusher 6, and at the end closer to the adjustment ring 3, the piston has a fin 7 with a puncturing tip 8. A drive spring 10 is positioned inside the device, between the end face 9 of the push element 2 and the piston 5. A return spring 11 is positioned inside the sleeve 1, between the piston 5 and the adjusting ring 3. In this particular embodiment the piston 5 has outwardly directed wings 12 at the upper section, which rest on the upper edge 13 of the sleeve 1.

[0010] A perspective view of the adjusting ring 3 is shown in Fig. 2. The adjusting ring 3 has an opening 4 for receiving the puncturing tip 8. It also has, directed inwardly into the sleeve 1, two half-ringed, oblique limiting members 14, 15, which allow smooth adjustment of the depth to which the puncturing tip 8 penetrates the skin of a patient. Alternatively, the limiting members may be arranged as steps, instead of as smooth oblique limiting members 14, 15, for regulation of the depth of penetration in a stepwise manner. As shown in Fig. 3, the outer surface of the adjusting ring 3 is provided with a marker 16, and the outer surface of the sleeve 1 is provided with a scale 17 placed in front of marker 16, to indicate the depth of the puncturing tip 8, in use.

[0011] The device according to the present invention operates in the following manner. The position of the elements of the device before use is shown in fig. 1. As a result of the pressure applied by the drive spring 10, the wings 12 of the piston 5 rest on the upper edge 13 of the sleeve 1. In this way, the piston 5 with puncturing tip 8 is held in a first stable position. Pressing the push element 2 causes compression of the drive spring 10 to the point that the end face 9 of the push element 2 rests on pusher 6 of the piston 5.

[0012] Applying further pressure to the push element 2 causes the wings 12 of the piston 5 to break off, and the drive spring 10 driving the piston 5 causes the fin 7 of piston 5 to hit the members 14, 15 thus limiting the

extension of the projecting tip through the opening 4 of the adjusting ring 3, and thus limiting the depth of the puncture of the patient's skin. Subsequently, the return spring 11 withdraws the piston 5 with the puncturing tip 8, which then assumes a second stable position inside the sleeve 1.

[0013] The depth of the puncture of the patient's skin is adjusted by turning the adjusting ring 3 about the axis of the device, preferably with use of a ratchet mechanism. In this way the position of the half-ringed, oblique limiting members 14, 15 may be altered in relation to fin 7 of the piston 5 and thus, after the fin 7 of the piston 5 hits the limiting members, the depth to which the puncturing tip 8 penetrates the patient's body is also altered.

[0014] The position of the elements of the device after use is shown in Fig. 4. The broken off wings 12 of the piston 5 are shown. Reuse of the device once the wings 12 have been broken off is not possible.

[0015] Although the apparatus for a sampling device, for regulating the depth of puncture of a sampling device, has been described with reference to a sampling device where the piston has breakable wings, it will be appreciated that such an apparatus can be used with devices without such wings. Alternatively, the sleeve, rather than the piston, may have breakable wings on which an external projection of the piston rests prior to use. Or, the piston may have a detachable flange on its outer surface that rests on the first end of the sleeve. Such alternative arrangements of breakable wings are described in co-pending European Patent application filed on 4<sup>th</sup> April 2001, the disclosures of which are incorporated herein by reference.

## Claims

1. A sampling device comprising a sleeve (1), a push element (2) mounted at a first end of the sleeve (1), a piston (5) having a fin (7) and a puncturing tip (8) extending from the fin (7), the piston (5) being slidably mounted in the sleeve (1), a drive spring (10) positioned between the end face (9) of the push element (2) and the piston (5), wherein at the other end of the sleeve (1) an adjusting ring (3) is mounted having an opening (4) for receiving the puncturing tip (8), the adjusting ring having two inner semi-annular limiting members (14, 15) each having a substantially oblique abutment surface, against which, the fin (7) of the piston (5) abuts during use.
2. A sampling device as claimed in claim 1, wherein the abutment surface of each limiting member (14, 15) is a substantially smooth curve.
3. A sampling device as claimed in claim 1, wherein the abutment surface of each limiting member (14, 15) comprises a series of steps.

4. A sampling device according to my preceding claim wherein the side surface of the adjusting ring (3) is provided with a marker (16) and the outer surface of the sleeve (1) is provided with a scale (17), for indicating the depth of the puncture of the sampling device, in use.
5. A sampling device according to any preceding claim wherein the sleeve (1) has breakable wings directed inwardly and the piston (5) has an external projection which rests on the wings.
6. A sampling device according to any of claims 1 to 4 wherein the piston (5) has breakable wings (12) or a detachable flange which rests on the upper edge (13) of sleeve (1).
7. A sampling device according to any of claims 1 to 4 wherein the sleeve (1) comprises a washer having breakable wings and an outer ring, the washer being positioned at the first end of the sleeve (1) and the piston (5) has an external projection which rests on the wings.
8. An apparatus for a sampling device, for regulating the depth of puncture of the sampling device, the sampling device comprising a sleeve (1), a push element (2) mounted at one end of the above sleeve, a piston (5) having a fin (7) and a puncturing tip (8) extending from the fin (7), the piston (5) being slidably mounted in the sleeve (1), the apparatus being mountable on the other end of the sleeve (1), and the apparatus comprising an adjusting ring (3) having an opening (4) for receiving the puncturing tip (8), the adjusting ring having two inner semi-annular limiting members (14, 15) each having a substantially oblique abutment surface, against which, the fin (7) of the piston (5) abuts during use.
9. An apparatus as claimed in claim 8 wherein the abutment surface of each limiting member (14, 15) is a substantially smooth curve.
10. An apparatus as claimed in claim 8 wherein the abutment surface of each limiting member (14, 15) comprises a series of steps.

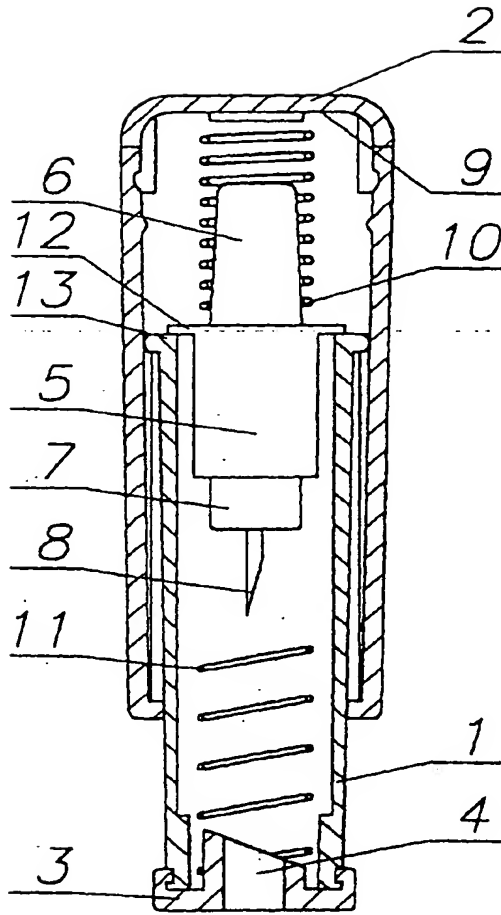


Fig. 1

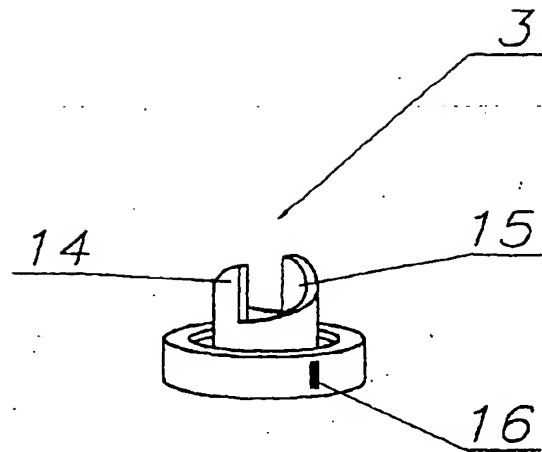


Fig. 2

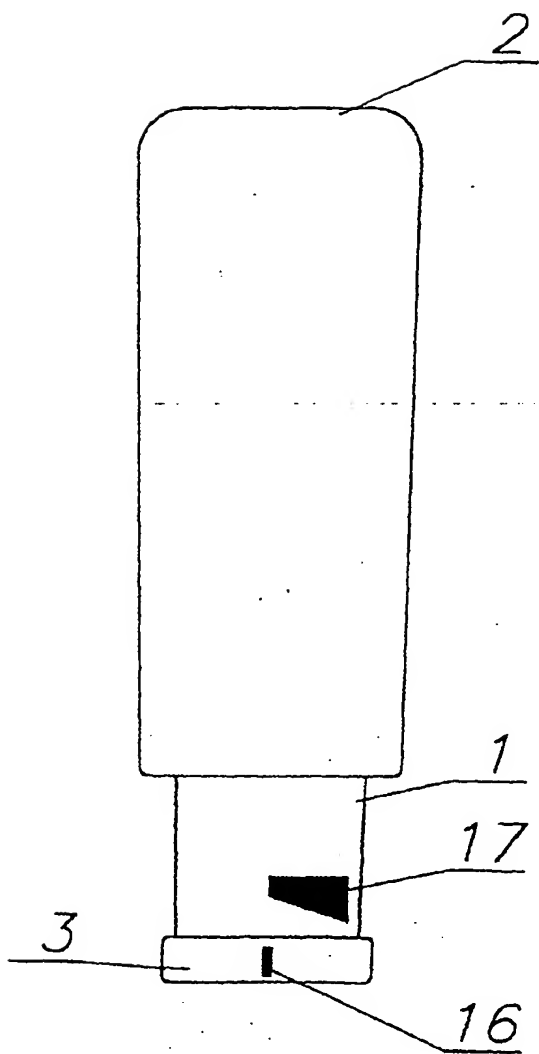


Fig. 3

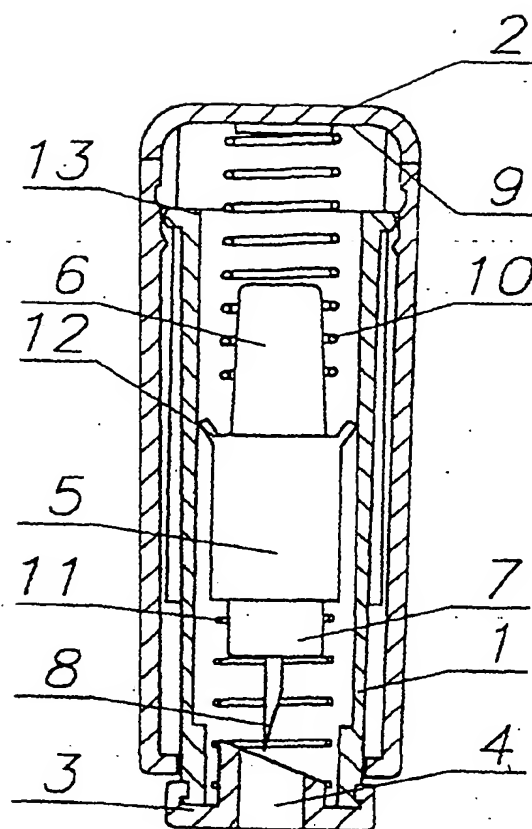


Fig. 4



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# EUROPEAN SEARCH REPORT

Application Number  
EP 01 30 3242

DOCUMENTS CONSIDERED TO BE RELEVANT			
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Y	---	3,5-7,10	
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X	US 5 613 978 A (HARDING JOHN D) 25 March 1997 (1997-03-25) * abstract; figures 1-4 *	1,2,4,8,9	
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The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 13 August 2001	Examiner Jonsson, P.O.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document</p> <p>T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons a: member of the same patent family, corresponding document</p>			

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